

IV. *An Account of an Eruption of Mount Vesuvius, which happened in August, 1779. In a Letter from Sir William Hamilton, K. B. F. R. S. to Joseph Banks, Esq. P. R. S.*

Read Dec. 16, 1779.

S I R,

Naples,
October 1, 1779.

THE late eruption of Mount Vesuvius was of so singular a nature, so very violent and alarming, that it necessarily attracted the attention of every one, not only in its immediate neighbourhood, but for many miles around; and, consequently, several slight descriptions of it have been already handed about, and some (as I am informed) more accurate and circumstantial are preparing for the press ^(a).

That on which the Abbot BOTTIS is actually employed, by command of his Sicilian Majesty, will undoubtedly be executed with the same accuracy, truth,

(a) The inhabitants of this great city in general give so little attention to Mount Vesuvius, though in full view of the greatest part of it, that I am well convinced many of its eruptions pass totally unnoticed by at least two thirds of them.

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and

and precision, as have rendered that author's former publications upon the subject of Mount Vesuvius so universally and deservedly esteemed.

Such a publication, executed with magnificence in the royal printing office, may, perhaps, render every other account of the late eruption superfluous: nevertheless, I should think myself in some degree guilty of a neglect towards the Royal Society, who have done so much honour to my former communications, if I did not, through the respectable canal of its worthy president, and my good friend, simply relate to them such remarkable circumstances as attended the late tremendous explosions of Mount Vesuvius, and as either came immediately under my own inspection, or have been related to me by such good authority as cannot be called in question.

Since the great eruption of 1767, of which I had the honour of giving a particular account to the Royal Society, Vesuvius has never been free from smoke, nor ever many months without throwing up red-hot scorix, which, increasing to a certain degree, were usually followed by a current of liquid lava, and except in the eruption of 1777, those lavas broke out nearly from the same spot, and ran much in the same direction, as that of the famous eruption of 1767.

No less than nine such eruptions are recorded here since the great one abovementioned, and some of them were considerable. I never failed visiting those lavas whilst they were in full force, and as constantly examined them and the crater of the volcano after the ceasing of each eruption ^(b).

It would be but a repetition of what has been described in my former letters on this subject, were I to relate my remarks on those different expeditions. The lavas, when they either boiled over the crater, or broke out from the conical parts of the volcano, constantly formed channels as regular as if they had been cut by art down the steep part of the mountain, and, whilst in a state of perfect fusion, continued their course in those channels, which were sometimes full to the brim, and at other times more or less so, according to the quantity of matter in motion.

These channels, upon examination after an eruption, I have found to be in general from two to five or six feet

(b) The last visit to the crater of Vesuvius, which was in the month of May, 1779, was my fifty-eighth, and to be sure I have been four times as often on parts of the mountain, without climbing to its summit, and after all am not ashamed to own, that I comprehend very little of the wonders I have seen in this great laboratory of nature; yet there have been naturalists of such a wonderful penetrating genius, as to have thought themselves sufficiently qualified to account for every hidden phenomenon of Vesuvius, after having, literally speaking, given the volcano *un coup d'œil*.

wide, and seven or eight feet deep. They were often hid from the fight by a quantity of *scoriæ* that had formed a cruft over them, and the lava having been conveyed in a covered way for fome yards, came out freſh again into an open channel. After an eruption I have walked in fome of thoſe fubterraneous or covered galleries which were exceedingly curious, the fides, top and bottom, being worn perfectly ſmooth and even in moſt parts by the violence of the currents of the red-hot lavas, which they had conveyed for many weeks ſucceſſively; in others, the lava had incruſted the fides of thoſe channels with ſome very extraordinary *ſcoriæ*: beautifully ramiſied white ſalts ^(c), in the form of dropping ſtalactites, were alſo attached to many parts of the cieling of thoſe galleries. It is imagined here, that the ſalts of Vefuvius are chiefly ammoniac, though often tinged with green, deep, or pale yellow, by the vapour of various minerals.

In the month of May laſt, there was a conſiderable eruption of Mount Vefuvius, when I paſſed a night on the mountain in the company of one of my countrymen, as eager as myſelf in the purſuit of this branch of natural hiſtory ^(d).

(c) I ſent a large ſpecimen of this curious volcanic production to the Britiſh Muſeum laſt year.

(d) Mr. BOWDLER, of Bath.

We saw the operation of the lava, in the channels as abovementioned, in the greatest perfection; but it was, indeed, owing to our perseverance, and some degree of resolution. After the lava had quitted its regular channels, it spread itself in the valley, and, being loaded with *scoriæ*, ran gently on, like a river that had been frozen, and had masses of ice floating on it: the wind changing when we were close to this gentle stream of lava, which might be about fifty or sixty feet in breadth, incommoded us so much with its heat and smoke, that we must have returned without having satisfied our curiosity, had not our guide ^(e) proposed the expedient of walking across it, which, to our astonishment, he instantly put in execution, and with so little difficulty, that we followed him without hesitation, having felt no other inconveniency than what proceeded from the violence of the heat on our legs and feet; the crust of the lava was so tough, besides being loaded with cinders and *scoriæ*, that our weight made not the least impression on it, and its motion was so slow, that we were not in any danger of losing our balance and falling on it: however, this experiment should not be tried except in cases of real necessity; and I mention it with no other view than to point out a pos-

(e) BARTOLOMEO, the Cyclops of Vesuvius, who has attended me on all my expeditions to the mountain, and who is an excellent guide.

sibility of escaping, should any one hereafter, upon such an expedition as ours, have the misfortune to be inclosed between two currents of lava.

Having thus got rid of the troublesome heat and smoke, we coasted the river of lava and its channels up to its very source, within a quarter of a mile of the crater. The liquid and red-hot matter bubbled up violently, with a hissing and crackling noise, like that which attends the playing off of an artificial firework, and by the continual splashing up of the vitrified matter, a kind of arch or dome was formed over the crevice from whence the lava issued. It was cracked in many parts, and appeared red-hot within, like an heated oven: this hollowed hillock might be about fifteen feet high, and the lava that ran from under it was received into a regular channel, raised upon a sort of wall of *scorie* and cinders, almost perpendicularly, of about the height of eight or ten feet, resembling much an ancient aqueduct.

We then went up to the crater of the volcano, in which we found, as usual, a little mountain throwing *scorie* and red-hot matter with loud explosions; but the smoke and smell of sulphur was so intolerable, that we were under the necessity of quitting that curious spot with the utmost precipitation.

In another of my excursions to Mount Vesuvius last year, I picked up some fragments of large and regular crystals of close-grained lava or basalt, the diameter of which, when the prisms were complete, may have been eight or nine inches. As Vesuvius does not exhibit any lava's regularly crystallized, and forming what are vulgarly called Giants Causeways (except a lava that ran into the sea near Torre del Greco in 1631, and which in a small degree has such an appearance), this discovery gave me the greatest pleasure ^(f).

After this slight sketch of the most remarkable events on Vesuvius since the year 1767, which I flatter myself will not be unacceptable, as it may serve to connect what I am going to relate with what has already been communicated to the Society in my former letters on the same subject, I come to the account of the late eruption, which affords indeed ample matter for curious speculation.

(f) As the fragments of basalt columns, which I found on the cone of Vesuvius, had been evidently thrown out of its crater, may not lava be more subject to crystallize within the bowels of a volcano than after its emission, and having been exposed to the open air? And may not many of the Giants Causeways, already discovered, be the *nuclei* of volcanic mountains, whose lighter and less solid parts may have been worn away by the hand of time? Mr. FAUJES DE ST. FOND, in his curious book lately published, and intitled, "*Recherches sur les Volcains éteints du Vivarais et du Velay*," gives (p. 286.) an example of basalt columns, that are placed deep within the crater of an extinguished volcano.

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As many poetical descriptions of this eruption will not be wanting, I shall confine mine to simple matter of fact in plain prose, and endeavour to convey to you, SIR, as clearly and as distinctly as I am able, what I saw myself, and the impression it made upon me at the time, without aiming in the least at a flowery style.

The usual symptoms of an approaching eruption, such as rumbling noises and explosions within the bowels of the volcano, a quantity of smoke issuing with force from its crater, accompanied at times with an emission of red-hot *scoriae* and ashes, were manifest, more or less, during the whole month of July; and towards the end of the month, those symptoms were increased to such a degree as to exhibit in the night-time the most beautiful fire-works that can be imagined.

These kinds of throws of red-hot *scoriae* and other volcanic matter, which at night are so bright and luminous, appear in broad day-light like so many black spots in the midst of the white smoke; and it is this circumstance that occasions the vulgar and false supposition, that volcanos burn much more violently at night than in the day-time.

On Thursday, the 5th of August last, about two o'clock in the afternoon, I perceived from my villa at Paufilipo in the bay of Naples, from whence I have a

full view of Vefuvius (which is juft oppofite, and at the diftance of about fix miles in a direct line from it) that the volcano was in a moft violent agitation: a white and fulphureous fmoke iffued continually and impetuously from its crater, one puff impelling another, and by an accumulation of thofe, clouds of fmoke refembling bales of the whiteft cotton. Such a mafs of them was foon piled over the top of the volcano as exceeded the height and fize of the mountain itfelf at leaft four times. In the midft of this very white fmoke, an immense quantity of ftones, *ſcoriæ*, and afhes, were ſhot up to a wonderful height, certainly not lefs than two thouſand feet. I could alfo perceive, by the help of one of RAMSDEN'S moſt excellent refracting teleſcopes, at times, a quantity of liquid lava, ſeemingly very weighty, juſt heaved up high enough to clear the rim of the crater, and then take its courſe impetuously down the ſteep fide of Vefuvius, oppofite to Somma. Soon after a lava broke out on the ſame fide from about the middle of the conical part of the volcano, and, having run with violence ſome hours, ceafed ſuddenly, juſt before it had arrived at the cultivated parts of the mountain above Portici, near four miles from the ſpot where it iffued.

During this day's eruption, as I have been credibly informed ſince, the heat was intolerable at the towns of

Somma and Ottaiano; and was likewise sensibly felt at Palma and Lauro, which are much farther from Vesuvius than the former. Minute ashes, of a reddish hue, fell so thick at Somma and Ottaiano, that they darkened the air in such a manner as that objects could not be distinguished at the distance of ten feet. Long filaments of a vitrified matter like spun-glass were mixed and fell with these ashes^(g); and the sulphureous smoke was so violent, that several birds in cages were suffocated, the leaves of the trees in the neighbourhood of Somma and Ottaiano were covered with white salts very corrosive. About two o'clock in the afternoon, an extraordinary globe of smoke, of a very great diameter, was distinctly perceived, by many of the inhabitants of Portici, to issue from the crater of Vesuvius, and proceed hastily towards the mountain of Somma, against which it struck and dispersed itself, having left a train of white smoke, mark-

(g) During an eruption of the volcano in the isle of Bourbon in 1766, some miles of country, at the distance of six leagues from that volcano, were covered with a flexible, capillary, yellow glass, some of which were two or three feet long, with small vitreous globules at a little distance one from the other. Count BUFFON shewed me some of this capillary and flexible glass, which is preserved in the Royal Museum at Paris, and which perfectly resembles the filaments of vitrified matter which fell at Ottaiano and in other parts on the borders of Vesuvius during this eruption. SORRENTINO, in his *Istoria del Vesuvio*, published at Naples in 1734, likewise mentions vitrified matter, like herbs and straw, being found on the ground in the neighbourhood of Vesuvius during an eruption of that mountain in the year 1724.

ing the course it had taken: this train I perceived plainly from my villa, as it lasted some minutes; but I did not see the globe itself.

A poor labourer, who was making faggots on the mountain of Somma, lost his life at this time, and his body not having been found, it is supposed that, suffocated by the smoke, he must have fallen into the valley from the craggy rocks on which he was at work, and been covered by the current of lava that took its course through that valley soon after. An ass, that was waiting for its master in the valley, left it very judiciously as soon as the mountain became violent, and, arriving safe home, gave the first alarm to this poor man's family.

It was generally remarked, that the explosions of the volcano were attended with more noise during this day's eruption than in any of the succeeding ones, when, most probably, the mouth of Vesuvius was widened, and the volcanic matter had a freer passage. It is certain, however, that the great eruption of 1767 (which in every other respect was mild, when compared to the late violent eruption) occasioned much greater concussions in the air by its louder explosions.

Friday, August the 6th, the fermentation in the mountain was less violent; but, about noon, there was a loud report, at which time it was supposed, that a portion
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of the little mountain within the crater had fallen in. At night the throws from the crater increased, and proceeded evidently from two separate mouths, which emitting red-hot *scoriae*, and in different directions, formed a most beautiful and almost continued fire-work.

On Saturday, August the 7th, the volcano remained much in the same state; but, about twelve o'clock at night, its fermentation increased greatly. The second fever-fit of the mountain may be said to have manifested itself at this time. I was watching its motions from the mole of Naples, which has a full view of the volcano, and had been witness to several glorious picturesque effects produced by the reflection of the deep red fire, which issued from the crater of Vefuvius, and mounted up in the midst of the huge clouds, when a summer storm, called here *a tropea*, came on suddenly, and blended its heavy watry clouds with the sulphureous and mineral ones, which were already like so many other mountains, piled over the summit of the volcano; at this moment a fountain of fire was shot up to an incredible height, casting so bright a light, that the smallest objects could be clearly distinguished at any place within six miles or more of Vefuvius.

The black stormy clouds passing swiftly over, and at times covering the whole or a part of, the bright column
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of fire, at other times clearing away, and giving a full view of it, with the various tints produced by its reverberated light on the white clouds above, in contrast with the pale flashes of forked lightning that attended the *tropea*, formed such a scene as no power of art can ever express.

That which followed the next evening was surely much more formidable and alarming; but this was more beautiful and sublime than even the most lively imagination can paint to itself. This great explosion did not last above eight or ten minutes, after which Vesuvius was totally eclipsed by the dark clouds, and there fell a heavy shower of rain.

Some *scoriae* and small stones fell at Ottaiano during this eruption, and some of a very great size in the valley between Vesuvius and the Hermitage. All the inhabitants of the towns at the foot of the volcano were in the greatest alarm, and preparing to abandon their houses, had the eruption continued longer.

One of his Sicilian Majesty's game-keepers, who was out in the fields near Ottaiano, whilst this combined storm was at its height, was greatly surprized to find the drops of rain scald his face and hands, which phenomenon was probably occasioned by the clouds having acquired a great degree of heat in passing through the
above

above mentioned column of fire. The King of Naples did me the honour of informing me of this curious circumstance.

Sunday, August the 8th, Vefuvius was quiet till towards fix o'clock in the evening, when a great smoke began to gather again over its crater, and about an hour after, a rumbling fubteranneous noife was heard in the neighbourhood of the volcano; the ufual throws of red-hot ftones and *ſcoriæ* began, and increafed every inftant. I was at this time at Pauſilipo, in the company of ſeveral of my countrymen, obſerving with good teleſcopes the curious phenomena in the crater of Vefuvius, which, with ſuch help, we could diſtinguiſh as well as if we had been actually ſeated on the ſummit of the volcano. The crater ſeemed much enlarged by the violence of laſt night's exploſions, and the little mountain no longer exiſted. At about nine o'clock there was a loud report, which ſhook the houſes at Portici and its neighbourhood to ſuch a degree as to alarm their inhabitants, and drive them out into the ſtreets; and, as I have ſince ſeen, many windows were broken, and walls cracked, by the concuſſion of the air from that exploſion, though faintly heard at Naples.

In an inſtant a fountain of liquid tranſparent fire began to riſe, and, gradually increaſing, arrived at ſo amazing
a height

a height as to strike every one who beheld it with the most awful astonishment. I shall scarcely be credited when I assure you, SIR, that, to the best of my judgment, the height of this stupendous column of fire could not be less than three times that of Vesuvius itself, which, as you know, rises perpendicularly near 3700 feet above the level of the sea ^(b).

Puffs of smoke, as black as can possibly be imagined, succeeded one another hastily, and accompanied the red-hot, transparent, and liquid lava, interrupting its splendid brightness here and there by patches of the darkest hue. Within these puffs of smoke, at the very moment of their emission from the crater, I could perceive a bright, but pale, electrical fire, briskly playing about in zig zag lines ⁽ⁱ⁾.

The wind was S.W.; and though gentle was sufficient to carry these detached clouds or puffs of smoke out of the column of fire, and a collection of them, by degrees, formed a black and extensive curtain (if I may be al-

(b) Se tu se' or lettore, a creder lento
 Ciò, ch'è Io dirò, non farà maraviglia;
 Che Io, che l' vidi; appena il mi consento.

DANTE INF. Cant. xxv. verso 46.

(i) I mention this circumstance to prove, that the electrical matter, so manifest during this eruption, actually proceeded from the bowels of the volcano, and was not attracted from a great height in the air, and conducted into its crater by the vast column of smoke.

lowed the expression) behind it; in other parts of the sky it was perfectly clear, and the stars were bright.

The fiery fountain, of so gigantic a size, upon the dark ground above mentioned, made the most glorious contrast imaginable, and the blaze of it reflected strongly on the surface of the sea, which was at that time perfectly smooth, added greatly to this sublime view.

The liquid lava, mixed with stones and *scorie*, after having mounted, I verily believe, at the least ten thousand feet, was partly directed by the wind towards Ottaviano, and partly falling almost perpendicularly, still red-hot and liquid, on Vesuvius, covered its whole cone, part of that of the mountain of Somma, and the valley between them. The falling matter being nearly as vivid and inflamed as that which was continually issuing fresh from the crater, formed with it one complete body of fire, which could not be less than two miles and a half in breadth, and of the extraordinary height above mentioned, casting a heat to the distance of at least six miles around it.

The brush wood on the mountain of Somma was soon in a blaze, which flame, being of a different tint from the deep red of the matter thrown out of the volcano, and from the silvery blue of the electrical fire, still added to the contrast of this most extraordinary scene.

The black cloud increafing greatly once bent towards Naples, and feemed to threaten this fair city with speedy deftruction; for it was charged with electrical matter, which kept constantly darting about it in ftrong and bright zig zags, juft like thofe defcribed by PLINY the younger in his letter to TACITUS, and which accompanied the great eruption of Vefuvius that proved fatal to his uncle ^(k). This volcanic lightning, however, as I particularly remarked, very rarely quitted the cloud, but ufually returned to the great column of fire towards the crater of the volcano from whence it originally came ^(l). Once or twice, indeed, I faw this lightning (or *ferilli* as it is called here) fall on the top of Somma, and fet fire to fome dry grafs and bufhes ^(m).

Fortunately

(k) “ Ab altero latere, nubes atra, et horrenda, ignei fpiritus tortis vi
“ bratisque difcurfibus rupta, in longas flammaram figuras dehifcebat; fulgoribus
“ illæ, et fimiles et majores.” PLIN. Epift.

(l) SORRENTINO mentions the like obfervation, which he made during an eruption of Vefuvius in 1707, when the fame kind of black cloud bent over Naples; thefe are his words. “ Alle ore 19. tutti i cittadini nelle ofcure tenebre
“ fi trovarono in mezzo delle Saëtte, delle quali, alcune vedeanfi ufcir dalla for-
“ nace del Vefuvio, e fcorrere fino al capo di Paufilipo, d’onde non paffando
“ più inanzi fuor la nuvola delle ceneri, o divertirfi altronde, indietro per
“ l’ifteffa linea tornarono a fcopiar fu la fornace, onde ufcirono: qual moto re-
“ trogrado mai hopotuto intendere.”

(m) Some time after the eruption had ceafed, the air continued greatly impregnated with electrical matter. The Duke of Cotrofiano, a Neapolitan nobleman (who, from his fuperior knowledge in experimental philofophy and
mechanics,

Fortunately for us the wind increasing from the S.W. quarter, carried back the threatening cloud just as it had reached the city, and began to occasion great alarm. All public diversions ceased in an instant, and the theatres being shut, the doors of the churches were thrown open. Numerous processions were formed in the streets, and women and children, with dishevelled heads, filled the air with their cries, insisting loudly upon the relics of St. Januarius being immediately opposed to the fury of the mountain: in short, the populace of this great city began to display its usual extravagant mixture of riot and bigotry, and if some speedy and well-timed precautions had not been taken, Naples would, perhaps, have been in more danger of suffering from the irregularities of its lower class of inhabitants than from the angry volcano.

But to return to my subject: after the column of fire had continued in full force near half an hour, the eruption ceased all at once, and Vesuvius remained fallen and silent. After the dazzling light of the fiery fountain ⁽ⁿ⁾, mechanics, does honour to his country) told me, that having, about half an hour after the great eruption had ceased, held a Leyden bottle, armed with a pointed wire, out of his window at Naples, it soon became considerably charged. Whilst the eruption was in force, its appearance was too alarming to allow one to think of such experiments.

(n) The light diffused by this huge column of fire was so strong, that the most minute objects could be discerned clearly within the compass of ten miles or more round the mountain. Mr. MORRIS, an English gentleman, told me, that at Sorrento, which is twelve miles from Vesuvius, he read the title page of a book by that volcanic light.

all seemed dark and dismal, except the cone of Vesuvius, which was covered with glowing cinders and *scorie*, from under which, at times, here and there, small streams of liquid lava escaped, and rolled down the steep sides of the volcano. This scene put me in mind of MARTIAL'S description of Etna:

Cuncta jacent flammis, et tristi merfa favilla.

In the parts of Naples nearest Vesuvius, whilst the eruption lasted, a mixed smell, like that of sulphur, with the vapours of an iron foundery, was sensible; but nearer to the mountain that smell was very offensive, as I have often found it in my visits to Vesuvius during an eruption.

Thus, SIR, have I endeavoured to convey to you at least a faint idea of a scene so glorious and sublime as, perhaps, may have never before been viewed by human eyes, at least in such perfection.

I am sensible, from the traces of them I have observed in the volcanic strata, which compose the greatest part of this country, that there have been many more considerable eruptions than the one just described; yet, most probably, those very violent eruptions must either have been attended with earthquakes, and other such alarming circumstances, as to make the beholders less attentive to the beauty of the scenes such phenomena offered than to
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their own safety; or clouds of smoke and ashes, as is usually the case in all great eruptions, must have so far obscured the volcano, as to exhibit only a confused mass of fire and smoke.

Whilst we had been enjoying the extraordinary sight of this gigantic fountain of liquid fire in perfect safety, the unfortunate inhabitants of the other side of the mountain of Somma, particularly at Ottaiano and Cacciabella, were involved in that dark and sooty cloud which formed so proper a back ground to our bright picture, and were pelted with stones and *scoriae* of lava; but I shall presently give you a particular description of their truly distressful situations, just as I had it from many of the poor sufferers themselves, when I visited that part of the country a few days after this eruption.

Monday, August the 9th, about nine o'clock in the morning, the fourth fever-fit of the mountain began to manifest itself by the usual symptoms, such as a subterraneous boiling noise, violent explosions of inflamed matter from the crater of the volcano, accompanied with smoke and ashes, which symptoms increased every instant. The smoke was of two sorts; the one as white as snow, and the other as black as jet.

The white, as described in the former part of this journal, rolled gently mass over mass, resembling bales
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of the softest cotton; and the black composed of *scoriae* and minute ashes shot up with force in the midst of the white smoke, which, from the minerals, was also sometimes tinged with yellow, blue, and green. Presently such a tremendous mass of these accumulated clouds stood over Vesuvius as seemed to threaten Naples again, and actually made the mountain itself appear a mole-hill.

This day's eruption was similar to that of Thursday last, but many degrees more violent. Some stones, thrown near as high as those of last night, fell on the mountain of Somma, and set fire to the brush wood with which it is covered; but there being little wind, and that West-erly, the volcanic matter rose and fell in a more perpendicular direction, and Ottaiano did not suffer by this day's eruption; but most of the inhabitants of the towns, on the borders of Vesuvius, fled to Naples, alarmed by the tremendous clouds and the loud explosions.

We remarked, that several very large stones, after having mounted to an immense height, formed a parabola, leaving behind them a trace of white smoke that marked their course; some burst in the air exactly like bombs, and others fell into the valley between Somma and Vesuvius without bursting; others again burst into
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a thousand pieces soon after their emission from the crater: they might very properly be called volcanic bombs.

In the smoke issuing from the crater of Vefuvius we often remarked a sudden brisk and quivering motion, which seemed to communicate itself instantaneously from one cloud to another, and sometimes affected those that were very high in the great mass above the volcano. Though I could not discern any electrical fire, yet I make no doubt, but that the effect above mentioned was occasioned by it, and would have been visible in the night-time.

Upon the whole, this day's eruption was very alarming; until the lava broke out about two o'clock, and ran three miles between the two mountains, we were in continual apprehension of some fatal event. It continued to run about three hours, during which time every other symptom of the mountain fever gradually abated, and at seven o'clock at night all was calm.

It was universally remarked, that the air this night, for many hours after the eruption, was filled with meteors, such as are vulgarly called falling stars; they shot generally in an horizontal direction, leaving a luminous trace behind them, but which quickly disappeared. The night was remarkably fine, star-light, and without a cloud. This kind of electrical fire seemed to be harmless,

less, and never to reach the ground; whereas that with which the black volcanic cloud of last night was pregnant appeared mischievous, like the lightning that attends a severe thunder storm, as we should undoubtedly have experienced, had the eruption continued longer, and the cloud spread over Naples. The same kind of lightning proved fatal to several people, and did great damage within the space of many miles round Vesuvius during its great eruption of 1631, as is mentioned in one of my former letters on this subject.

During this day's eruption the relics of St. Januarius were carried in procession, and exposed to the furious mountain from the bridge of the Maddalena, amidst a prodigious concourse of people, who are at this moment well convinced, that to this ceremony alone Naples may attribute its happy escape.

It was from their Sicilian Majesties palace at Paufilipo that I made my observations on this day's eruption, and in the presence of their Majesties, who had been pleased to send for me in the morning, as soon as the volcano became turbulent.

Tuesday, August the 10th, Vesuvius was quiet.

Wednesday, August the 11th, about six o'clock in the morning, the fifth and last fever-fit of the mountain came on, and gradually increased. About twelve o'clock
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it was at its height ^(o), and very violent indeed, the explosions being louder than those that attended the former eruptions, we could not judge of the height of the volleys of stones and *scoriæ*, as some rainy clouds were blended with the volcanic ones, and hid the upper part of the cone and crater of Vesuvius from our view.

The same mountains of white cotton-like clouds, piled one over another, rose to such an extraordinary height, and formed such a colossal mass over Vesuvius, as cannot possibly be described, or scarcely imagined. It may have been from a scene of this kind, that the ancient poets took their ideas of the giants waging war with Jupiter.

About five o'clock in the evening the eruption ceased, some rain having fallen this day, which having been greatly impregnated with the corrosive salts of the volcano, did much damage to the vines in its neighbourhood.

Thursday and Friday, the 12th and 13th of August, Vesuvius continued to smoke considerably, and at times slight explosions were heard, like cannon at a great distance; but there have been no more throws from its cra-

(o) It has been remarked by the oldest people in the neighbourhood of Vesuvius, that in its eruptions the volcano is subject to a crisis at noon and midnight; and, indeed, from my own observation, I believe that remark to be well-founded.

ter, nor any streams of lava from its flanks, since Wednesday last.

On Saturday, August the 15th, I went, accompanied by Count LAMBERG, the Imperial Minister at this Court, to visit Ottaiano and Caccia-bella, the district which had been most severely treated by the heavy and destructive shower of volcanic matter from the crater of Vesuvius last Sunday night.

Soon after having passed the town of Somma, we began to perceive, that the heat of the fiery shower, which had fallen in its neighbourhood, had affected the leaves of the trees and vines, which we found still more parched and shrivelled in proportion as we approached the town of Ottaiano, which may be about three miles from Somma. At about the distance of a mile from Somma, we began to perceive fresh cinders or *scoriæ* of lava, thinly scattered on the road and in the fields. Every step we advanced we found them of a larger dimension, and in greater abundance. At the distance of a mile and a half from Ottaiano, the soil was totally covered by them, and the leaves and fruit were either intirely stripped from the trees, or remained thinly on them, shrivelled and dried up by the intense heat of the volcanic shower.

After having passed through the most fertile country, abounding with trees loaded with fruits of every kind, and the most luxuriant vegetation, through gay villages crouded with chearful inhabitants, to come at once to such a scene of desolation and misery, affording to our view nothing but heaps of black cinders and ashes, blasted trees, ruined houses, with a few of their scattered inhabitants just returned with ghastly, dismayed countenances, to survey the havock done to their tenements and habitations, and from which they themselves had with much difficulty escaped alive on Sunday last, was such a melancholy scene as can neither be described or forgotten.

We found the roof of his Sicilian Majesty's sporting seat at Caccia-bella much damaged by the fall of large stones and heavy *scoriae*, some of which, after having been broken by their fall through the roof, still weighed upwards of thirty pounds. This place, in a direct line, cannot be less than four miles from the crater of Vefuvius.

The most authentic accounts have been received of the fall of small volcanic stones and cinders (some of which weighed two ounces) at Benevento, Foggia, and Monte Mileto, upwards of thirty miles from Vefu-

vius ^(p); but what is most extraordinary (as there was but little wind during the eruption of the eighth of August) minute ashes fell thick that very night upon the town of Manfredonia, which is at the distance of an hundred miles from Vefuvius ^(q).

These facts seem to confirm the extreme supposed height of the column of fire that issued from the crater of Vefuvius last Sunday night, and are greatly in support of what we find recorded in the history of Vefuvius with respect to the fall of its ashes at an amazing distance, and in a short space of time, during its violent eruptions.

We proceeded from Caccia-bella to Ottaiano, which is a mile nearer to Vefuvius, and is reckoned to contain twelve thousand inhabitants. Nothing could be more dismal than the sight of this town, unroofed, half buried

(p) The prince of Monte Mileto told me, that his son, the Duke of Popoli, who was at Monte Mileto the 8th of August, had been alarmed by the shower of cinders that fell there, some of which he had sent to Naples, weighing two ounces; and that stones of an ounce had fallen upon an estate of his ten miles farther off. Monte Mileto is about thirty miles from the volcano.

(q) The Abbé GALIANI, well known in the literary world, told me, that his sister, a nun in a Convent at Manfredonia, had wrote to enquire after him, imagining that Naples must have been destroyed, when they, at so great a distance, had been so much alarmed by a shower of minute ashes, which fell on that city at eleven o'clock at night, the 8th of August, as to open all the churches, and go to prayers. As the great eruption happened at nine o'clock at night, the ashes must have travelled an hundred miles within the short space of two hours.

under

under black *scoriæ* and ashes, all the windows towards the mountain broken, and some of the houses themselves burnt, the streets choaked up with these ashes (in some that were narrow, the *stratum* was not less than four feet thick), and a few of the inhabitants just returned were employed in clearing them away, and piling up the ashes in hillocks to get at their ruined houses. Others were assembled in little groups, inquiring after their friends and neighbours, relating each other's woes, crossing themselves, and lifting up their eyes to Heaven when they mentioned their miraculous escapes. Some monks, who were in their convent during the whole of the horrid shower, gave us the following particulars, which they related with solemnity and precision.

The mountain of Somma, at the foot of which Ottaviano is situated, hides Vefuvius from its sight, so that till the eruption became considerable it was not visible to them. On Sunday night, when the noise increased, and the fire began to appear above the mountain of Somma, many of the inhabitants of this town flew to the churches, and others were preparing to quit the town, when a sudden violent report was heard; soon after which they found themselves involved in a thick cloud of smoke and minute ashes: a horrid clashing noise was heard in the air, and presently fell a deluge of stones and

large

large *scoria*, some of which *scoria* were of the diameter of seven or eight feet, and must have weighed more than an hundred pounds before they were broken by their fall, as some of the fragments of them, which I picked up in the streets, still weighed upwards of sixty pounds. When these large vitrified masses either struck against one another in the air, or fell on the ground, they broke in many pieces, and covered a large space around them with vivid sparks of fire, which communicated their heat to every thing that was combustible ^(r). In an instant the town, and country about it, was on fire in many parts; for in the vineyards there were several straw huts, which had been erected for the watchmen of the grapes, all of which were burnt. A great magazine of wood in the heart of the town was all in a blaze, and, had there been much wind, the flames must have spread universally, and all the inhabitants would have infallibly been burnt in their houses, for it was impossible for them to stir out. Some who attempted it with pillows, tables, chairs, the tops of wine casks, &c. on their heads, were either knocked down, or soon driven back to their close quarters under arches, and in the cellars of their houses. Many

(r) These masses were formed of the liquid lava, the exterior parts of which had become black and porous by cooling in the long traverse they had made through the air, whilst the interior parts, less exposed, retained an extreme heat, and were perfectly red.

were

were wounded, but only two persons have died of the wounds they received from this dreadful volcanic shower. To add to the horror of the scene, incessant volcanic lightning was whisking about the black cloud that surrounded them, and the sulphureous smell and heat would scarcely allow them to draw their breath.

In this miserable and alarming situation they remained about twenty-five minutes, when the volcanic storm ceased all at once, and the frightened inhabitants of Ottaiano, apprehending a fresh attack from the turbulent mountain, hastily quitted the country, after having deposited the sick and bed-ridden, at their own desire, in the churches.

Had the eruption lasted an hour longer, Ottaiano must have remained exactly in the state of Pompeia, which was buried under the ashes of Vesuvius just 1700 years ago, with most of its inhabitants, whose bones are to this day frequently found under arches and in the cellars of the houses of that ancient city.

We were told of many miracles that had been wrought by the images of saints at this place during the late disaster; but, as they are quite foreign to my purpose, I shall, as usual, pass them over in silence.

The palace of the Prince of Ottaiano is situated on an eminence above the town, and nearer the mountain, the
steps

steps leading up to it, being deeply covered with volcanic matter, resembled the cone of Vesuvius, and the white marble statues on the balustrade made a singular appearance peeping from under the black ashes, which had entirely covered both the balustrade and their pedestals. The roof of the palace was totally destroyed, and the windows were broken; but the house itself, being strongly built, had not suffered much.

We had an opportunity of seeing here exactly the quality of the dreadful shower, as the volcanic matter, which broke through the roof of the palace, and fell into the garrets on the balconies and in the courts, had not been removed. It was composed of the *scorie* of fresh lava much vitrified, great and small, mixed with fragments of ancient solid lavas of different sorts: many pieces were enveloped by the new lava, which formed a crust about them; and others were only slightly varnished by the fresh lava. These kind of stones being very compact, and some weighing eight or ten pounds, must have fallen with greater force than the heavier *scorie*, which were very porous, and had the great surface above mentioned.

The palace of Ottaiano is built on a thick *stratum* of ancient lava, which ran from the mountain of Somma when in its active volcanic state. Under this *stratum* we
were

were shewn three grottoes, from which issues a constant extreme cold wind, and at times with impetuosity, and a noise like water dashing upon rocks. They are shut up with doors like cellars, and are made use of as such, as also to keep provisions fresh and to cool liquors. I had never seen these *ventaroli* before. In my letter to Dr. MATY, upon the nature of the soil round Naples, I have mentioned others of the same kind that I had met with on Vesuvius, Etna, and in the Island of Ischia⁽¹⁾.

We observed, that the tract of country completely covered with a *stratum* of the volcanic matter above mentioned was about two miles and a half broad, and as much in length, in which space the vines and fruit trees were totally stripped of their leaves and fruit, and had the appearance of being quite burnt up; but, to my great surprize, having visited that country again two days ago, I saw those very trees, which were apple, pear, peach, and apricot, in blossom again, and some with the fruit already formed, and of the size of hazel-nuts. The vines there had also put forth fresh leaves, and were in

(1) At Cesi, in the Roman State, towards the Adriatic, there are many such *ventaroli*; and the inhabitants of that town, by means of leaden pipes, conduct the fresh air from them into the very rooms of their houses, so that by turning a cock they can cool them to any degree. Some who have refined still more upon this luxury, by smaller pipes, bring this cold air under the dining-table, so as to cool the bottle of liquor upon it.

bloom. Many foxes, hares, and other game, were destroyed by the fiery shower in the district of Somma and Ottaiano ⁽¹⁾

His Sicilian Majesty, whose goodness of heart inclines him on all occasions to shew his benevolence and assist the unfortunate, has ordered a considerable sum of money to be distributed among the unhappy sufferers of Ottaiano and its neighbourhood.

On the 18th of September I went upon Mount Vesuvius, accompanied by Lord HERBERT and my usual guide. We could not possibly reach its crater, being covered with a thick smoke, too sulphureous and offensive to be encountered; neither would it have been prudent to have ventured up, had there not been that impediment, as it was evident, from the loud reports we heard from time to time, that there existed still a great fermentation within the bowels of the volcano. We therefore contented ourselves with examining the effects of the late extraordinary eruption on its cone, and in the valley between it and the mountain of Somma.

The conical part of Vesuvius is now covered with fragments of lava and *scoriæ*, which makes the ascent

(1) Having had the honour of being on a shooting party lately with the King of Naples, at the foot of Vesuvius and Somma, several dead hares were found, and we killed others whose backs were quite bare, the fur having been singed off of them by the hot ashes.

much

much more difficult and troublesome than when it was only covered with minute ashes. The particularity of this last eruption was, that the lava which usually ran out of the flanks of the volcano, forming cascades, rivers, and rivulets of liquid fire, was now chiefly thrown up from its crater in the form of a gigantic fountain of fire^(u), which falling still in some degree of fusion has, in a manner,

(u) SORRENTINO mentions, in his *Istoria del Vesuvio*, that the volcano in 1676 vented itself in the like manner. “Non a torrenti modo mandò fuori le sue viscere, ma tutti in aria menòlla.” Such wonderful, violent, and sudden emissions of liquid lava must have been occasioned by some accidental and extraordinary cause; and I was inclined to think, that a sudden communication of water with the lava in fusion might be the occasion of such a phenomenon, particularly as we know that pools of rain-water have been found formerly in caverns within the bowels of Vesuvius; and that a river, supposed to be that anciently called *Draco*, and which was buried by an ancient eruption, burst out some years ago with such force, from under a *stratum* of lava at Torre del Greco, as to be sufficient to turn mills there; but a late curious experiment, mentioned by *Monf. DE FAUJAS*, in his *Recherches sur les Volcans éteints*, p. 176. seems to contradict my supposition; and that water introduced to the furnace of a volcano, finding there a more rarified air, would not produce an explosion. *Monf. DESLAUDES*, Director of the Royal Manufacture of Looking-glasses at St. Gobin, made the following experiment in 1768, in the presence of the Duke DE LA ROCHEFOUCAULT, *Monf. DE FAUJAS*, and others. He poured some water upon a quantity of glass in fusion, and which had been in that state in the crucible for twelve hours. The water did not occasion the least fermentation; but, on the contrary, rolled upon its surface, without even producing any smoke, and after having become seemingly red-hot, like the metal in fusion, disappeared in about three minutes, without having occasioned the least explosion. If the great emissions of lava above mentioned were not then occasioned by water mixing with the lava, may not they have been produced by violent

a manner, cased up the conical part of Vefuvius with a *stratum* of hard *scoriæ*: on the side next the mountain of Somma, that *stratum* is surely more than one hundred feet thick, forming a high ridge. The valley between Vefuvius and Somma has received such a prodigious quantity of lava and other volcanic matter during this last eruption, that it is raised, as is imagined, two hundred and fifty feet or more. Three such eruptions as the last would completely fill up the valley, and, by uniting Vefuvius and Somma, form them into one mountain, as they most probably were before the great eruption in the reign of TITUS. In short, I found the whole face of Vefuvius changed. Those curious channels, in which the lava ran in the month of May last, are all buried. The volcano appears to have likewise increased in height; the form of the crater is changed, a great piece of its rim towards Somma being wanting; and on the side towards the sea it is also broken. There are some very large cracks towards the point of the cone of the volcano, which makes it probable, that more of the borders of the crater will fall in. The ridge of fresh volcanic matter on the cone of Vefuvius towards Somma, and the thick *stratum* in the valley, are likewise

subterraneous exhalations having forced their way into the cauldron of the volcano (if I may be allowed the expression) replete with matter in fusion, and blown its whole contents, with what even opposed its passage, at once into the air?

full

full of cracks, from which there issues a constant sulphureous smoke that tinges them and the circumjacent *scorie* and cinders with a deep yellow, or sometimes a white tint. These last mentioned cracks, though deep, do not, as I apprehend, pass the *stratum* formed by the last eruption, and which, from its extreme thickness, particularly in the valley, will probably retain a great degree of heat for some years to come, as did a thick *stratum* of lava that ran into the *fossa grande* in the year 1767.

The number and size of the stones, or, more properly speaking, of the fragments of lava which have been thrown out of the volcano in the course of the last eruption, and which lie scattered thick on the cone of Vesuvius, and at the foot of it, is really incredible. The largest we measured was in circumference no less than one hundred and eight English feet, and seventeen feet high. It is a solid block, and is much vitrified: in some parts of it there are large pieces of pure glass, of a brown yellow colour, like that of which our common bottles are made, and throughout its pores seem to be filled with perfect vitrifications of the same sort. The spot where it alighted is plainly marked by a deep impression almost at the foot of the cone of the volcano, and it took three bounds before it settled, as is plainly perceived by the marks

marks it has left on the ground, and by the stones which it has pounded to atoms under its prodigious weight. When we consider the enormous size and weight of such a solid mass, thrown at least a quarter of a mile clear of the mouth of the volcano, we can but admire the wonderful powers of nature, of which, being so very seldom within the reach of human inspection, we are in general too apt to judge upon much too small a scale.

Another solid block of ancient lava, sixty-six feet in circumference, and nineteen feet high, being nearly of a spherical shape, was thrown out at the same time, and lies near the former. This stone, which has the marks of having been rounded, nay almost polished, by continual rolling in torrents, or on the sea-shore, and which yet has been so undoubtedly thrown out of the volcano, may be the subject of curious speculations ^(x). Another block of solid lava that was thrown much farther, and lies in the valley between the cone of Vesuvius and the Hermitage, is sixteen feet high, and ninety-two feet in circumference, though it plainly appears, by the large fragments that lie round, and were detached from it by the shock

(x) Or may not this stone be a spherical volcanic basalt, such as one of forty-five feet in circumference, described by Monf. FAUJAS DE ST. FOND, in p. 155. of his curious book on the subject of extinguished volcanos?

of its fall, that it must have been twice as considerable when in the air.

There are thousands of very large fragments of different species of ancient and modern lavas, that lie scattered by the late explosions on the cone of Vesuvius, and in the vallies at its foot; but these three were the largest of those we measured ^(y).

We found also many fragments of those volcanic bombs that burst in the air, as mentioned in the former part of this journal; and some entire, having fallen to the ground without bursting. The fresh red-hot and liquid lava having been thrown up with numberless fragments of ancient lavas, the latter were often closely enveloped by the former; and probably when such fragments of lava were porous and full of air bubbles, as is often the case, the extreme outward heat, suddenly rarifying the confined air, caused an explosion. When these fragments were of a more compact lava they did not explode, but were simply inclosed by the fresh lava, and acquired a spherical form by whirling in the air, or rolling down the steep sides of the volcano.

(y) We measured two other stones in the valley between Somma and Vesuvius; the one was twenty-two feet and a half long, thirteen feet and a half broad, and ten feet high; the other, eleven feet and a half high, and seventy-two feet in circumference.

The shell or outward coat of the bombs that burst, and of which we found several pieces, was always composed of fresh lava, in which many splinters of the more ancient lava that had been inclosed are seen sticking. I was much pleased with this discovery, having been greatly puzzled for an explanation of this volcanic operation, which was new to me, and which was very frequent during the eruption of the 9th of August.

The phenomenon of the natural spun-glass, which fell at Ottaiano with the ashes on the 5th of August, was likewise clearly explained to me here. I have already mentioned, that the lava thrown up by this eruption was in general more perfectly vitrified than that of any former eruption, which appeared plainly upon a nearer examination of the fragments of fresh lava, the pores of which we generally found full of a pure vitrification, and the *scorie* themselves, upon a close examination with a magnifying glass, appeared like a confused heap of filaments of a fowl vitrification. When a piece of the solid fresh lava had been cracked in its fall without separating entirely, we always saw capillary fibres of perfect glass, reaching from side to side within the cracks. If I may be allowed a mean comparison, which, however, conveys the idea of what I wish to explain better than any other I can think of, this lava resembled a rich Parmesan
cheese,

cheefe, which, when broken and gently separated, spins out transparent filaments from the little cells that contained the clammy liquor of which those filaments were composed. The natural spun-glass, then, that fell at Ottaiano during this eruption, as well as that which fell in the Isle of Bourbon in the year 1766, must have been formed, most probably, by the operation of such a sort of lava as has been just described, cracking and separating in the air at the time of its emission from the craters of the volcanos, and by that means spinning out the pure vitrified matter from its pores or cells, the wind at the same time carrying off those filaments of glass as fast as they were produced.

I observed, sticking to some very large fragments of the new lava, which were of a close grain, some pieces of a substance, whose texture very much resembled that of a true pumice stone; and, upon a close examination, and having separated them from the lava, I perceived, that this substance had actually been forced out of the minute pores of the solid stone itself, and was a collection of fine vitreous fibres or filaments, confounded together at the time of their being pressed out by the contraction of the large fragments of lava in cooling, and which had bent downwards by their own weight. This curious substance has the lightness of a

pumice, and resembles it in every respect except being of a darker colour.

When the pores of the fresh solid lava were large and filled with pure vitrified matter, we found that matter sometimes blown into bubbles on its surface, I suppose, by the air which had been forced out at the time the lava contracted itself in cooling: those bubbles, being thin, shewed that this volcanic glass has the kind of transparency of our common glass bottles, and is like them of a dirty yellow colour. I detached with a hammer some large pieces of this kind of glass as big as my fist, which adhered to, and was incorporated with, some of the larger fragments of lava, and, though of the same kind, from their thickness they appeared perfectly black, and were opaque.

Another particularity is remarkable in the lava of this eruption: many detached pieces of it are in the shape of a barley-corn or of a plumb-stone, small at each end, and thick in the middle. We picked up several, and saw many more which were too heavy for us to carry off, for they must have weighed more than sixty pounds; some of the smaller ones did not weigh an ounce. I suppose them to be drops from the liquid fountain of fire of the 8th of August, which might very naturally acquire such a form in their fall; but the peasants in the neighbourhood

bourhood of Vesuvius are well convinced that they are the thunder-bolts that fell with the volcanic lightning.

We found many of the volcanic bombs or, properly speaking, round balls of fresh lava, large and small; all of which have a *nucleus* composed of a fragment of more ancient and solid lava. There were also some other curious vitrifications, very different from any I had ever seen before, mixed with the late fallen shower of huge *scorie* and masses of lava.

Though I have endeavoured to be as particular and clear as possible in the description I have given of the curious substances produced by the late eruption of Vesuvius, yet, as specimens of those substances will explain more at one sight than I can pretend to do by whole pages in writing, I shall not fail to send you, by the first favourable opportunity, a collection of them, which I have set apart for that purpose, particularly as, I flatter myself, they may serve to give some light into a hitherto obscure subject: I mean, the nature and manner of the formation of pumice-stones.

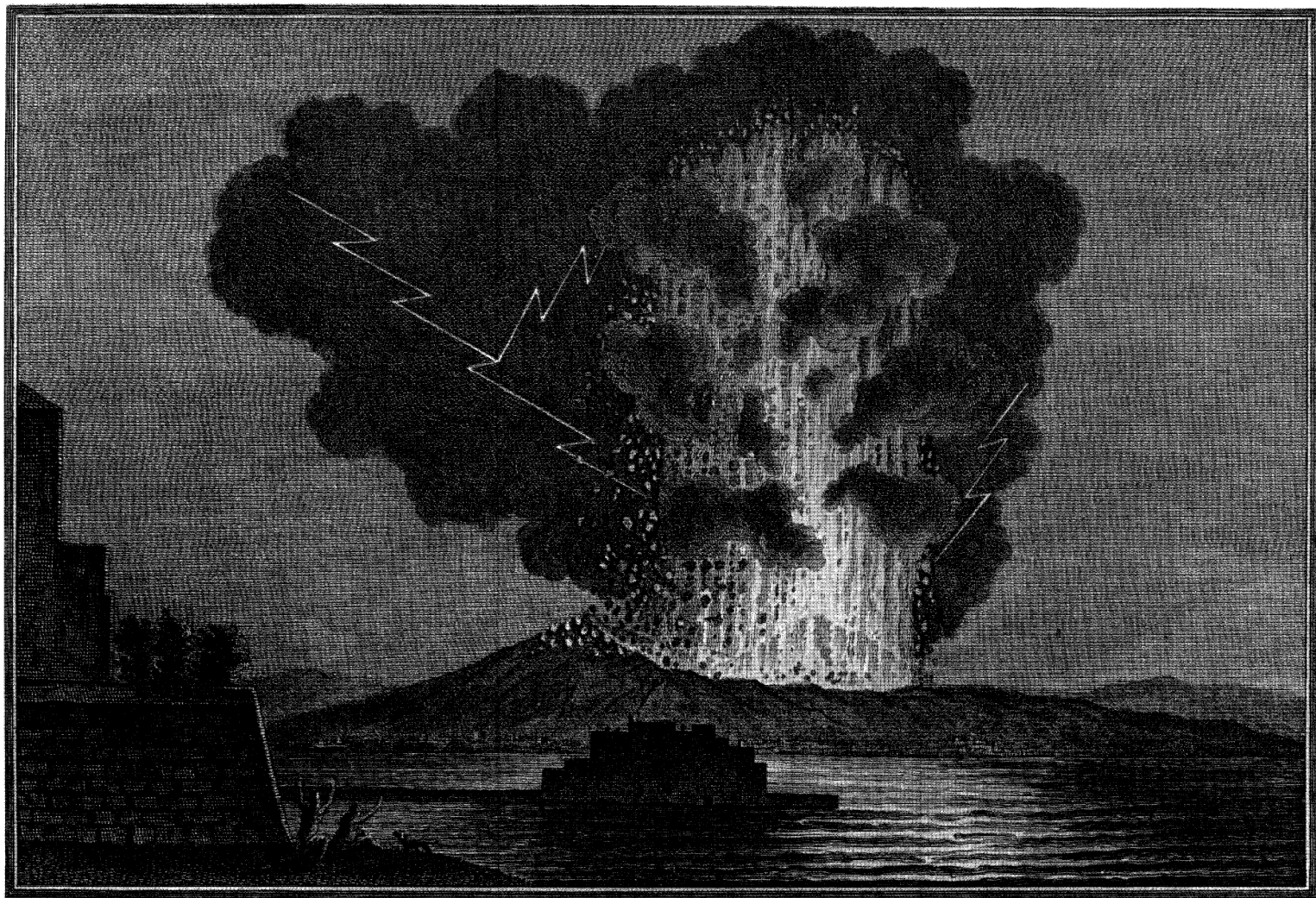
Vesuvius continues to smoke considerably, and we had a slight shock of an earthquake yesterday; so that I do not think, notwithstanding the late eruptions having been so very considerable, that the volcano has vented itself so sufficiently as to remain long quiet.

84 *Sir WILLIAM HAMILTON's Account, &c.*

I must now, SIR, beg your pardon if I have trespassed too much upon your time: I meant to be short, clear, and explicit; and if, by aiming at the two latter, I have failed in the former, I hope I shall be excused, and that you will please to take the will for the deed.

I am, &c.





F. Progenie del.

Engraved by Bysse.

View of the Eruption of M. Vesuvius Aug^t 8th 1779 from Pausitipo.